Flow sensor (anemometer), 29008 Dofs, 1 to 3 parameters

Example with 1 parameter:

$$G(p) = C((sE - A1 - p(A2 - A1))^{-1}B)$$

with fluid velocity $p(= v) \in [0, 1]$ as single parameter and output as difference between the two sensors:

$$C(1, 173) = 1, \quad C(1, 133) = -1.$$

Compute C by applying the permutation as follows:

$$C = CP^T.$$

For simulation: u is heater with step function (at id 35).

The following matrices are available:

anemometer.B	load vector
anemometer.E	damping matrix
anemometer.P	permutation matrix (matrix built with ANSYS, for adapting nodes and dofs)
anemometer.A1, A2	stiffness matrices (A1 diffusion, A2 diffusion and convection)

Use mmread for reading the matrices into matlab.

Example with 3 parameters:
(infos about the matrices were extracted from IMTEK Mathematica code)

$$G(c,\kappa,v) = C((s\underbrace{(E_s + cE_f)}_{E(p_0)} - \underbrace{(A_{d,s} + \kappa A_{d,f} + cvA_c)}_{A(p_1,p_2)})^{-1}B)$$

and output as difference between the two sensors:

$$C(1,173) = 1, \quad C(1,133) = -1.$$

Compute C by applying the permutation as follows:

$$C = CP^T.$$

The parameter are typically in the intervals:

$c \in [0,1]$	specific heat $(= p_0)$
$\kappa \in [1,2]$	thermal conductivity $(= p_2)$
$v \in [0.1,2]$	fluid velocity $(p_1 = cv)$

The following matrices are available:

E_s	=	anemometer.E1
E_f	=	anemometer.E2 - anemometer.E1
$A_{d,s}$	=	anemometer.A1
$A_{d,f}$	=	chop(anemometer.A3 - anemometer.A1) + chop(anemometer.A4 - anemometer.A5)
A_c	=	anemometer.A2 - anemometer.A1
B	=	anemometer.B

Take care of too small numbers (otherwise you will obtain illconditioned matrices). Thus, filter them out:
In Mathematica: Chop[expr, delta] replaces numbers smaller in absolute magnitude than delta by 0.
In matlab (chop =):

$$A = A. * (abs(A) >= 10^{-12});$$